

Wyoming FFA
2012 Agricultural Technology and Mechanical Systems
Career Development Event

You will have **60 minutes** to complete this examination. Answer the multiple choice questions by selecting the one best answer for each question. **Mark your answers on the answer sheet provided.**

Do not write on this exam

SECTION 1: Machinery & Equipment Systems Questions 1-10

1. A _____ is designed into most hydraulic systems to prevent damage due to excessive pressure.
 - a. Directional control valve
 - b. Lift control valve
 - c. **Relief valve**
 - d. Flow control valve

2. Determine the FHP (Fluid Horsepower) of a hydraulic pump when it is pumping 30 gal/min at 1000 psi. Formula $FHP = p \times Q / 1714$
 - a. 114
 - b. 25.71
 - c. 35
 - d. **17.50**

3. Operator's manuals recommend that diesel tanks be filled at the end of each day to
 - a. **prevent moisture condensation**
 - b. allow trash to settle out
 - c. reduce the need for a fuel filter
 - d. prevent trash from entering the fuel tank.

4. What is a **MAJOR** difference in using hydraulic fluid as compared to air pressure to transfer force?
 - a. Air pressure needs to circulate through a circuit.
 - b. Hydraulic fluid can be compressed, but air can not.
 - c. **Hydraulic fluid cannot be compressed, but air can be.**
 - d. Hydraulic fluid depends on the use of pneumatics.

5. As spray nozzle tips wear, the chemical application rate that the nozzles are capable of applying _____?
 - a. **Increases**
 - b. Decreases
 - c. Stays the same
 - d. The nozzles should not wear down because they are ceramic

6. The acronym, PLN, stands for:
- Pump Line Nozzle**
 - Pressure Lubricated Nozzle
 - Pressurized Lightweight Nozzle
 - None of the above
7. Bio-diesel is a mixture of:
- Butane and diesel fuel
 - Gasoline and #2 diesel fuel
 - Ethanol and diesel fuel
 - Diesel fuel and processed soybean oil**
8. During a 30-second sprayer calibration procedure, 26 ounces of liquid are collected from a spray tip. What is the tip's approximate delivery rate in gallons per minute?
Note: 1 gal = 128 ounces 1 minute = 60 seconds
- 0.2 gallon per minute
 - 0.3 gallon per minute
 - 0.4 gallon per minute**
 - 0.8 gallon per minute
9. The theoretical field capacity of a machine such as a windrower or forage harvester is a function of which two factors?
- Machine weight and horsepower
 - PTO speed and angle
 - Travel speed and working width**
 - Machine rating and velocity
10. The load capacity of a hydraulic cylinder is equal to
- Pressure X area of piston**
 - Pressure X radius of cylinder
 - Weight of object to be lifted
 - Length of ram

Section 2: Electrical Systems Questions 11-20

11. The continuous load supplied by a circuit should not exceed 80% of the branch circuit rating. After how many hours of continuous operation is a load considered to be a continuous load?
- One-half hour
 - One hour
 - Two hours
 - Three hours**
12. Which of the following terms represents a measure of the rate of flow of electricity in a conductor?
- Ampere**
 - Polarity
 - Volt
 - Watt

13. With the exception of piezoelectric and ultrasonic motors, the operation of electric motors is based on the principle of:
- Elasticity
 - Gravity
 - Magnetism**
 - Pressure
14. Under normal operating conditions, the on/off electric motor magnetic switch contacts are closed by a:
- Capacitors
 - Electro-magnet**
 - Inductance purge
 - Repulsion pulse
15. The stationary electromagnet in the electric motor is called a:
- Stator**
 - Rotor
 - Armature
 - None of the above
16. When selecting conductor size, the smaller the AWG number, the:
- Smaller the current-carrying capacity
 - Larger the current-carrying capacity**
 - Smaller the cross-sectional area
 - Thinner the insulation
17. Which of the following classifications of wire can be buried directly in the soil?
- T
 - THHN
 - TW
 - UF**
18. When it is necessary to reverse the direction of a split-phase motor, which of the following methods would be used?
- Shifting the brushes on the commutator
 - Reversing the power leads
 - Switching the leads to the starting windings**
 - This type of motor is not readily reversible
19. A ground-fault circuit interrupter (GFCI), works by breaking the circuit when current in the hot conductor and the _____ are not equal.
- Safety ground
 - Circuit breaker
 - Neutral**
 - None of the above
20. The overload protection of a branch circuit is determined by the amount of _____ that the conductor will safely carry.
- Amperage**
 - Voltage
 - Hertz
 - Cycles

Section 3: Energy Systems Questions 21 - 30

21. In the four-cycle engine, which of the following strokes allows for the fuel and air mixture to be pulled into the cylinder?
- Compression
 - Power
 - Intake**
 - Exhaust
22. When turning the needle valve clockwise on the carburetor you are:
- Leaning out the fuel : air mixture**
 - Leaning out the lube – oil : air mixture
 - Enriching the fuel : air mixture
 - None of the above are correct
23. Which of the following power source uses light energy?
- Air pressure
 - Hydraulics
 - Solar**
 - Steam
24. Which of the following small engine system maintenance areas require the MOST maintenance?
- Cooling
 - Compression
 - Fuel**
 - Ignition
25. Valve stems are held in alignment by a:
- Valve spring
 - Valve sleeve
 - Valve guide**
 - Cylinder block
26. The parts or sections of a small engine valve in a Briggs & Stratton Vanguard V-Twin OHV engine are:
- Stem, margin, face**
 - Stem, margin, seat
 - Stem, head, seat
 - Stem, face, toe
27. The most common method of increasing valve clearance on a small, air-cooled engine is to:
- Ream the valve guide
 - Knurl the valve guide
 - Grind the valve face
 - Grind the valve stem end**

28. When measuring valve clearance in a small gas engine, the cylinder should be set at _____ for proper adjustment.
- $\frac{1}{4}$ " before top dead center on the compression stroke
 - $\frac{1}{4}$ " **after top dead center on the compression stroke**
 - $\frac{1}{4}$ " before top dead center on the exhaust stroke
 - $\frac{1}{4}$ " after top dead center on the exhaust stroke
29. The _____ is an engine part that converts the up and down or linear motion of the piston to circular motion.
- Camshaft
 - Connecting rod
 - Crankshaft**
 - Flywheel
30. The middle ring on the piston is called the:
- Keystone ring
 - Compression ring**
 - Oil ring
 - Centering ring

Section 4: Structural Systems Questions 31 - 40

31. A weld placed in a joint created by a 90 degree angle is a/an:
- Butt weld
 - Fillet weld**
 - Spot weld
 - Tack weld
32. Which of the following terms is used to describe the continuous running time for which a welder was designed?
- Duty rating
 - Running specification
 - Duty cycle**
 - Ambient cycle
33. What electrical device is a necessary component of an electrical welding machine and is used to step up or step down the voltage and amperage as needed to perform welding operations?
- Alternator
 - Generator
 - Rheostat
 - Transformer**
34. What is the maximum allowable hose pressure in pounds per square inch (psi) for acetylene in oxy/acetylene cutting equipment?
- 5 psi
 - 15 psi**
 - 45 psi
 - 90 psi

35. What is the name of the automatic plumbing valve that allows fluid to flow in only one direction, but prevents the fluid from draining back when the line is not pressurized?
- Stop-and-waste valves
 - Gate valves
 - Compression hose faucets
 - Check valves**
36. What duty cycle rating is required for a welding machine that will operate at its maximum rating for six minutes continually during a ten-minute period?
- 20%
 - 40%
 - 60%**
 - 80%
37. The AWS classification of SMAW electrode, E6011, what does the "60" stand for?
- All positions
 - Tensile strength**
 - Flat/horizontal position
 - Vertical position
38. Which weld is laid between two pieces of metal set edge to edge or end to end?
- Butt**
 - Fillet
 - Spot
 - Tack
39. The lens shade numbers recommended for SMAW and GMAW welding are:
- 10, 11, 12**
 - 14, 16
 - 3, 4
 - 6, 8
40. Which of the following is not a function of the coating elements found in SMAW electrodes?
- Provide mechanical and metallurgical properties of the weld deposit
 - Shield the molten metal from oxygen and nitrogen
 - Keep the arc established when using direct current**
 - Produce slag coverage to protect the cooling weld metal

Section 5: Environmental and Natural Resource Systems Questions 41 - 50

41. Because higher temperatures improve manure decomposition, anaerobic lagoons work best during what season of the year?
- Winter
 - Spring
 - Fall
 - Summer**
42. A manure slurry is more viscous than liquid manure because it contains a higher percentage of

what component?

- a. Hydrogen
- b. Water
- c. **Solids**
- d. Phosphorus

43. Which of the following furrow openers are preferable for use when trash accumulation is a problem?
- a. **Double-disk**
 - b. Chisel-boot
 - c. Shoe-type
 - d. None of the above
44. As a general rule, the _____ type of spray nozzle is most preferred for broadcast application of contact herbicides, for an even uniform spray pattern.
- a. Solid cone
 - b. Hollow cone
 - c. **Flat fan**
 - d. Flood type
45. When calibrating sprayers for uniformity, it is best to catch and record the number of ounces sprayed by each nozzle over a _____ second period, then replace any nozzle whose output differs more than _____ percent from the average of all nozzles on the sprayer boom.
- a. **15; 5**
 - b. 20; 10
 - c. 25; 15
 - d. 30; 20
46. Which of the following tillage methods is **MOST** characteristic of conventional tillage?
- a. Crop seed placed directly into the residue of the previous crop
 - b. Current planting done without disturbing the topsoil
 - c. **Disking and plowing to incorporate previous crop into the soil**
 - d. Double-cropping soybeans in the stubble of wheat or oats
47. If one pot in a drip irrigation system of 100 pots is not getting enough water, one should check the:
- a. **Emitter**
 - b. Humidistat
 - c. Solenoid valve
 - d. Timer
48. The best type of irrigation system/s for sloping land is:
- a. Subsurface irrigation
 - b. Sprinkler and below surface sub-irrigation
 - c. Trickle or subsurface irrigation
 - d. **Trickle or sprinkler irrigation**
49. Which of the following is considered a manure storage lagoon?

- a. **An outside confined manure storage area which stabilizes the manure through microbial action**
- b. A farm pond
- c. A storage area beneath the slatted floor in a confinement building
- d. A blue metal structure with an airtight lid

50. A pesticide label specifies that 2.5 pints of pesticide concentration, mixed with 30 gallons of water, are to be applied per acre. How many gallons of pesticide concentration are required to treat a 160-acre field?

Note: 128 ounces = 1 gal 16 ounces = 1 pint

- a. 32 gallons
- b. **50 gallons**
- c. 64 gallons
- d. 3200 gallons